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10/825,893	04/16/2004	Zohar Yakhini	10020708-1	8979

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EXAMINER	
NEGIN, RUSSELL SCOTT	
ART UNIT	PAPER NUMBER
1631	

DATE MAILED: 09/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/825,893	YAKHINI ET AL.	
	Examiner	Art Unit	
	Russell S. Negin	1631	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12 and 14-28* is/are pending in the application.

4a) Of the above claim(s) *13 and 29* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12 and 14-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *9/2/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election with traverse of Group I (claims 1-12 and 14-28) in the reply filed on 19 June 2006 is acknowledged. The traversal is on the ground(s) that the Group II depends from Group I and thus, there would be no undue search burden. This is not found persuasive because mere mention of the first group within a second group does not alone constitute a lack of search burden between groups. In this case, searching the data set of Group II does not necessarily constitute searching Group I.

The requirement is still deemed proper and is therefore made FINAL.

Claims 13 and 29 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected Group, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 19 June 2006.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-12 and 14-28 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Upon consideration of the recent Official Gazette notice of November 22, 2005, entitled, "Interim Guidelines for examination of patent applications for patent subject

matter eligibility," (www.uspto.gov/web/offices/com/sol/og/2005/week47/patgupa.htm), the decision of the Office regarding the previously withdrawn 35 U.S.C. 101 rejection is reversed.

Claims 1-12, and 20-28 are drawn to a process and claims 14-19 are drawn to data structures and computers. A statutory process must include a step of a physical transformation, or produce a useful, concrete, and tangible result (State Street Bank & Trust Co. v. Signature Financial Group Inc. CAFC 47 USPQ2d 1596 (1998), AT&T Corp. v. Excel Communications Inc. (CAFC 50 USPQ2d 1447 (1999)). In the instant claims, there is no step of physical transformation, thus the Examiner must determine if the instant claims include a useful, concrete, and tangible result.

As noted in State Street Bank & Trust Co. v. Signature Financial Group Inc. CAFC 47 USPQ2d 1596 (1998) below, the statutory category of the claimed subject matter is not relevant to a determination of whether the claimed subject matter produces a useful, concrete, and tangible result:

> The question of whether a claim encompasses statutory subject matter should not focus on *which* of the four categories of subject matter a claim is directed -- process, machine, manufacture, or composition of matter--but rather on the essential characteristics of the subject matter, in particular, its practical utility. Section 101 specifies that statutory subject matter must also satisfy the other "conditions and requirements" of Title 35, including novelty, nonobviousness, and adequacy of disclosure and notice. *See In re Warmerdam* , 33 F.3d 1354, 1359, 31 USPQ2d 1754 (Fed. Cir. 1994). For purpose of our analysis, as noted above, claim 1 is directed to a machine programmed with the Hub and Spoke software and admittedly produces a "useful, concrete, and tangible result." *Alappat* , 33 F.3d at 1544, 31 USPQ2d at 1557. This renders it statutory subject matter, even if the useful result is expressed in numbers, such as price, profit, percentage, cost, or loss.

In regards to claims 1-12 and 14-28, the instant claims are drawn to an algorithm. An algorithm is non-statutory unless the claims include a step of physical transformation, or if the claims include a useful, tangible and concrete result. It is important to note, that the claims themselves must include a physical transformation step or a useful, tangible and concrete result in order for the claimed invention to be statutory. It is not sufficient that a physical transformation step or a useful, tangible, and concrete result be asserted in the specification for the claims to be statutory. In the instant claims, there is no step of physical transformation, thus the Examiner must determine if the instant claims include a useful, tangible, and concrete result.

In determining if the instant claims are useful, tangible, and concrete, the Examiner must determine each standard individually. For a claim to be "useful," the claim must produce a result that is specific, substantial, and credible. For a claim to be "tangible," the claim must set forth a practical application of the invention that produces a real-world result. For a claim to be "concrete," the process must have a result that can be substantially repeatable or the process must substantially produce the same result again. Furthermore, the claim must recite a useful, tangible, and concrete result in the claim itself, and the claim must be limited only to statutory embodiments. Thus, if the claim is broader than the statutory embodiments of the claim, the Examiner must reject the claim as non-statutory.

The instant claims do not include any tangible result. A tangible requirement requires that the claim must set forth a practical application of the algorithm to produce a real-world result. While the claims are directed to a method, system, or computer

product of an algorithm used to make paths between related strings, there is no tangible means of visualizing or displaying the output. Thus the instant claims do not include any tangible result.

As stated in the Official Gazette notice, "The tangible requirement does not necessarily mean that a claim must either be tied to a particular machine or apparatus or must operate to change articles or materials to a different state or thing. However, the tangible requirement does require that the claim must recite more than a Sec. 101 judicial exception, in that the process claim must set forth a practical application of that Sec. 101 judicial exception to produce a real-world result. Benson, 409 U.S. at 71-72, 175 USPQ at 676-77 (invention ineligible because had "no substantial practical application."). "[A]n application of a law of nature or mathematical formula to a . . . process may well be deserving of patent protection." Diehr, 450 U.S. at 187, 209 USPQ at 8 (emphasis added); see also Corning, 56 U.S. (15 How.) at 268, 14 L.Ed. 683 ("It is for the discovery or invention of some practical method or means of producing a beneficial result or effect, that a patent is granted . . ."). In other words, the opposite meaning of "tangible" is "abstract.""

The invention as claimed in the instant set of claims is an abstract algorithm.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 15-19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 15-19 are method claims claiming the method of a system. Claim 14 reads "A system of..." while claims 15-19 state, "The method of claim 14..." Applicant is required to correct for this inconsistency.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4, 7-8, 10-11, and 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Larson et al [Calculus with Analytic Geometry, 1990, D. C. Heath and Company; Lexington, Massachusetts; Section 14.1, pages 785-795] in view of Schadt et al [Journal of Cellular Biochemistry Supplement 37: 120-125, 2001].

1. A method for selecting a set of normalizing data points from n data sets, where n is at least 3, containing data points having values and identities, the method comprising: receiving n data sets; considering the data points to be distributed in an n-dimensional data-point space; determining one or more order-preserving sequences of data points within the n-dimensional data-point space; and selecting, as normalizing data points, data points from the one or more order-preserving sequences.

2. The method of claim 1 wherein the one or more order-preserving sequences of data points is a single, longest order-preserving sequence of data points.

3. The method of claim 1 wherein the data points within n data sets are associated with

weights and wherein the one or more order-preserving sequences of data points is an order-preserving sequence of data points with a greatest sum of weights.

4. The method of claim 1 wherein the one or more order-preserving sequences of data points is a longest order-preserving sequence of data points having a shortest Euclidian distance accumulated along a path from an initial data point of the order-preserving sequence to a final data point of the order-preserving sequence.

7. The method of claim 1 wherein considering the data points to be distributed in an n-dimensional data-point space further includes, for each data point, considering the data point to have a value in each of n-dimensions, the value of a data-point in an ith dimension equal to the value of the data point in an ith data set, where 1.ltoreq.i.ltoreq.n.

8. The method of claim 1 wherein determining an order-preserving sequence of data points within the n-dimensional data-point space further includes: for each currently considered dimension, ordering the data points with respect to the currently considered dimension; traversing the ordered data points in a first direction, determining a metric corresponding to a maximum subsequence for each data point in the first direction; and traversing the ordered data points in a second direction, determining a metric corresponding to a maximum subsequence for each data point in the second direction; summing the determined metrics for each data point in each dimension to produce a metric sum for each data point; and selecting as belonging to the maximum order-preserving sequence of data points those data points having a greatest metric sum.

10. The method of claim 8 wherein selecting, as normalizing data points, data points from the one or more order-preserving sequences further includes selecting data points of a single order-preserving sequence.

11. The method of claim 8 wherein selecting, as normalizing data points, data points from the one or more order-preserving sequences further includes selecting data points that most evenly partition the data points into subsets of data points.

14. A system for selecting a set of normalizing data points from n data sets, where n is at least 3, containing data points having values and identities, the system comprising: a processor; a memory; and computer instructions that select the set of normalizing data points from n data sets by receiving n data sets, considering the data points to be distributed in an n-dimensional data-point space, determining one or more order-preserving sequence of data points within the n-dimensional data-point space, and selecting, as normalizing data points, data points from the one or more order-preserving sequences.

15. The method of claim 14 wherein the one or more order-preserving sequences of data points is a single, longest order-preserving sequence of data points.

16. The method of claim 14 wherein the data points within n data sets are associated with weights and wherein the one or more order-preserving sequences of data points is an order-preserving sequence of data points with a greatest sum of weights.

17. The method of claim 14 wherein the one or more order-preserving sequences of data points is a longest order-preserving sequence of data points having a shortest Euclidian distance accumulated along a path from an initial data point of the order-preserving sequence to a final data point of the order-preserving sequence.

The section of Larson et al, entitled, "Solid analytic geometry and vectors in space," anticipates the method used to normalize data in the instant application.

In this instance, there are three dimensions, and points are distributed in three-dimensional space (see the Figures 14.1 through 14.7 on pages 785-787 of Larson et al).

The method of finding order-preserving sequences of data points in the instant applications involves iteration(s) of determining traces of points in the same octant as the point before it with each subsequent point determining its own coordinate system. Figures 14.1, 14.4 and 14.6 on page 785, 786, and 787 of Larson et al illustrate such an order-preserving sequence with a single set of three dimensional points forming a rectangular solid in the first octant and vectors pointing into the first octant. The rectangular solid is interpreted to be the longest order preserving sequence of data points.

Since there is no guidance in the original disclosure as to how to calculate "greatest sum of weights," it is interpreted that each point in the set of three-dimensional points is weighted equally and the above explanation applies to such claims.

Figures 14.1, 14.4 and 14.6 of Larson et al illustrate a line with the shortest Euclidean path between the points.

Each data point has a value in each of the three dimensions.

The rectangular solid in Figure 14.1 of Larson et al illustrates a situation where data points are ordered and traversed in all three directions in order to find greatest metric sums based on changes in each of the three dimensions.

Larson et al., while anticipating the set of claims does not clearly explain the claims in terms of the preferred embodiments of the disclosure.

Schadt et al, however, in the article entitled, "Feature extraction and normalization algorithms for high density oligonucleotide gene expression array data," explains the analogous method of normalization for a two-dimensional space with two variables (i.e. see pages 122-123 of Schadt et al along with Figure 2 on page 122] for the purpose of analysis of array hybridization data.

It would have been obvious at the time of the instant invention to modify the two dimensional hybridization analysis of Schadt et al. in view of the three dimensional description of Larson et al to result in the instantly claimed invention because Larson et al discloses a third dimension with a third set of variables (and an additional degree of freedom) for analyses of hybridization data.

Claims 20-23 and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Larson et al in view of Schadt et al as applied to claims 1-4, 7-8, 10-11, and 14-17 above in view of Chalmers:

[http://web.archive.org/web/20021008184825/http://www.s2.chalmers.se/~agrell/hyperc

ubes (Accessed on August 28, 2006; website last updated in 2002)].

Claims 20-23 and 26-27 state:

20. A method for selecting a set of normalizing data points from n data sets, where n is at least 4 and even, containing data points having values and identities, the method comprising: receiving n data sets; considering the data points to be distributed in n/2 2-dimensional data-point spaces; determining one or more order-preserving sequences of data points for each of the n/2 2-dimensional data-point spaces; and selecting, as normalizing data points, data points from the order-preserving sequences.

21. The method of claim 20 wherein the one or more order-preserving sequences of data points is a single, longest order-preserving sequence of data points.

22. The method of claim 20 wherein the data points within n data sets are associated with weights and wherein the one or more order-preserving sequences of data points is an order-preserving sequence of data points with a greatest sum of weights.

23. The method of claim 20 wherein the one or more order-preserving sequences of data points is a longest order-preserving sequence of data points having a shortest Euclidian distance accumulated along a path from an initial data point of the order-preserving sequence to a final data point of the order-preserving sequence.

26. The method of claim 20 wherein determining an order-preserving sequence of data points within a 2-dimensional data-point space further includes: for each currently considered dimension, ordering the data points with respect to the currently considered dimension; traversing the ordered data points in a first direction, determining a metric corresponding to a maximum subsequence for each data point in the first direction; and traversing the ordered data points in a second direction, determining a metric corresponding to a maximum subsequence for each data point in the second direction; summing the determined metrics for each data point in each dimension to produce a metric sum for each data point; and selecting as belonging to the maximum order-preserving sequence of data points those data points having a greatest metric sum.

27. The method of claim 20 wherein selecting, as normalizing data points, data points from the one or more order-preserving sequences further includes selecting data points which occur in the one or order-preserving sequences computed for greater than a threshold fraction of the n/2 2-dimensional data-point spaces.

The method of Larson et al. in view of Schadt et al as applied to claims 1-4, 7-8, 10-11, and 14-17 teaches analysis and normalization of hybridization data up to three dimensions.

However, the articles of Larson et al in view of Schadt et al are limited to three dimensions.

On page 1 of Chalmers, entitled, "A glimpse into high-dimensional space," multidimensional hypercubes are illustrated on two dimensional paper.

It would have been obvious to someone of ordinary skill in the art at the time of the instant invention to modify Larson et al in view of Schadt et al as applied to claims 1-4, 7-8, 10-11, and 14-17 in further view of Chalmers et al to result in the instantly claimed invention because while Larson et al in view of Schadt et al illustrates the appropriate algorithm for three dimensions, Chalmers has the capability and advantage of being able to employ the same algorithm for higher dimensions for the purpose of adding degrees of freedom and additional dimensions to hybridization array analyses and normalization.

Claims 1, 5, 6, 8, 9, 14, 18, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Larson et al in view of Schadt et al as applied to claims 1-4, 7-8, 10-11, and 14-17 in further view of Fredman [Discrete Mathematics, volume 11, 1975, pages 29-35].

Claims 1, 5, 6, 8, 9, 14, 18, and 19 state:

1. A method for selecting a set of normalizing data points from n data sets, where n is at least 3, containing data points having values and identities, the method comprising: receiving n data sets; considering the data points to be distributed in an n-dimensional data-point space; determining one or more order-preserving sequences of data points within the n-dimensional data-point space; and selecting, as normalizing data points, data points from the one or more order-preserving sequences.

5. The method of claim 1 wherein the one or more order-preserving sequences of data points are order-preserving sequences of data points of lengths within a threshold value of the length of an order-preserving sequence of data points of maximum length.

6. The method of claim 1 wherein the data points within n data sets are associated with weights and wherein the one or more order-preserving sequences of data points are order-preserving sequences of data points with sums of weights within a threshold value of the sum of weights of an order-preserving sequence of data points with a greatest sum of weights.

8. The method of claim 1 wherein determining an order-preserving sequence of data points within the n-dimensional data-point space further includes: for each currently considered dimension, ordering the data points with respect to the currently considered dimension; traversing the ordered data points in a first direction, determining a metric corresponding to a maximum subsequence for each data point in the first direction; and traversing the ordered data points in a second direction, determining a metric corresponding to a maximum subsequence for each data point in the second direction; summing the determined metrics for each data point in each dimension to produce a metric sum for each data point; and selecting as belonging to the maximum order-preserving sequence of data points those data points having a greatest metric sum.

9. The method of claim 8 wherein selecting, as normalizing data points, data points from the order-preserving sequence further includes selecting data points with a metric sum greater than a threshold value.

14. A system for selecting a set of normalizing data points from n data sets, where n is at least 3, containing data points having values and identities, the system comprising: a processor; a memory; and computer instructions that select the set of normalizing data points from n data sets by receiving n data sets, considering the data points to be distributed in an n-dimensional data-point space, determining one or more order-preserving sequence of data points within the n-dimensional data-point space, and selecting, as normalizing data points, data points from the one or more order-preserving sequences.

18. The method of claim 14 wherein the one or more order-preserving sequences of data points are order-preserving sequence of data points within a threshold value of an order-preserving sequences of data points of maximum length.

19. The method of claim 14 wherein the one or more order-preserving sequences of data points are order-preserving sequence of data points within a threshold value of an order-preserving sequences of data points with a greatest sum of weights.

The method of Larson et al. in view of Schadt et al as applied to claims 1-4, 7-8, 10-11, and 14-17 teaches analysis and normalization of hybridization data up to three dimensions.

However, Larson in view of Schadt et al does not teach usage of thresholds.

The article of Fredman, entitled, "On computing the length of longest increasing subsequences," teaches bounds and limits on the sequences in sections 2 and 3 on pages 30 and 31, respectively.

It would have been obvious at the time if the instant invention for someone of ordinary skill in the art to modify Larson et al. in view of Schadt et al as applied to claims 1-4, 7-8, 10-11, and 14-17 in further view of Fredman to result in the instantly claimed invention because Fredman teaches the same computations of longest increasing subsequences with thresholds for the purposes of better understanding sequences and the normalization of array data.

Claims 20, 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Larson et al. in view of Schadt et al in view of Chalmers as applied to claims 20-23 and 26-27 above, and further in view of Fredman.

Claims 20, 24 and 25 state:

20. A method for selecting a set of normalizing data points from n data sets, where n is at least 4 and even, containing data points having values and identities, the method comprising: receiving n data sets; considering the data points to be distributed in n/2 2-dimensional data-point spaces; determining one or more order-preserving sequences of data points for each of the n/2 2-dimensional data-point spaces; and selecting, as normalizing data points, data points from the order-preserving sequences.

24. The method of claim 20 wherein the one or more order-preserving sequences of data points are order-preserving sequences of data points within a threshold value of an order-preserving sequence of data points of maximum length.

25. The method of claim 20 wherein the data points within n data sets are associated with weights and wherein the one or more order-preserving sequences of data points are order-preserving sequences of data points with sums of weights within a threshold value of the sum of weights of an order-preserving sequence of data points with a greatest sum of weights.

While Larson et al. in view of Schadt et al in view of Chalmers teach analysis in dimensions greater than three, they do not teach the use of thresholds.

The article of Fredman, entitled, "On computing the length of longest increasing subsequences," teaches bounds and limits on the sequences in sections 2 and 3 on pages 30 and 31, respectively.

It would have been obvious at the time if the instant invention for someone of ordinary skill in the art to modify Larson et al. in view of Schadt et al in view Chalmers as applied to claims 20-23 and 26-27 above in further view of Fredman to result in the instantly claimed invention because Fredman teaches the same computations of longest increasing subsequences with thresholds for the purposes of better understanding sequences and the normalization of array data.

Conclusion

No claim is allowed.

Papers related to this application may be submitted to Technical Center 1600 by facsimile transmission. Papers should be faxed to Technical Center 1600 via the central PTO Fax Center. The faxing of such pages must conform with the notices published in the Official Gazette, 1096 OG 30 (November 15, 1988), 1156 OG 61 (November 16, 1993), and 1157 OG 94 (December 28, 1993)(See 37 CFR § 1.6(d)). The Central PTO Fax Center Number is (571) 273-8300.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Russell Negin, Ph.D., whose telephone number is (571) 272-1083. The examiner can normally be reached on Monday-Friday from 7am to 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's Supervisor, Andrew Wang, Supervisory Patent Examiner, can be reached at (571) 272-0811.

Any inquiry of a general nature or relating to the status of this application should be directed to Legal Instrument Examiner, Yolanda Chadwick, whose telephone number is (571) 272-0514.

Information regarding the status of the application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information on the PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

RSN
1 September 2006

1 September 2006

1 September 2006

JOHN S. BRUSCA, PH.D
PRIMARY EXAMINER